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ZOOLOGY.-A study of the type collections of some pseudoscorpions originally described by Nathan Banks. ${ }^{1}$ C. Clayton Hoff, Quincy College, Quincy, Ill. (Communicated by Edward A. Chapin.)

Through the kindness of Dr. Waldo L. Schmitt and Dr. Edward A. Chapin, of the United States National Museum, type specimens of several species of pseudoscorpions originally described by Nathan Banks $(1895,1901)$ were made available for study. The present paper is concerned with redescriptions of Banks's Garypus floridensis, "Garypus" bicornis, "Chelanops" arizonensis, "Chelifer" mirabilis, and "Chelifer" hubbardi. Unless otherwise indicated, observations and measurements have been made on specimens cleared in beechwood creosote and mounted in Canada balsam. Previous to mounting, the body, but not the appendages, was treated with potassium hydroxide solution. Measurements were made with a calibrated ocular micrometer, and the figures were outlined with the aid of a camera lucida.

[^0]Suborder Diplosphyronida Chamberlin, 1929
Family Garypidae Hansen, 1894
Garypus floridensis Banks, 1895
Figs. 1-3
Garypus floridensis Banks, 1895, Journ. New York Ent. Soc. 3: 9; non With, 1906, Danske Vid. Selsk. Skrifter, 7. Række, naturvidensk. og mathem., 3: 41, fig. 9, pl. 2, figs. 4a-d; non With, 1907, Journ. Linn. Soc. London, Zool., 30: 70-72, pl. 9, figs. 26-28; Chamberlin, 1921, Can. Ent. 53: 191; Chamberlin, 1930, Ann. Mag. Nat. Hist. (ser. 10) 5: 612; pro parte Beier, 1932, Das Tierreich 57: 220; Roewer, 1937, in Bronn's Klass. und Ord. des Tierreichs 5 (div. 4, book 6): 268.

The National Museum collection of cotypes consists of one male, one female, and one early nymph. The male was mounted on a slide and designated as the lectotype. The female and the nymph are stored in alcohol. The nymph was not studied.

Male.-Body fairly stout, appendages moderately slender; "body pale brown, legs and palpi, except claw, pale brownish yellow, claw red-brown" (Banks, 1895); length of body 4.6
mm . Carapace subtriangular in outline, the width very little less than the length, the anterior margin bilobed; carapace weakly granular before the eyes, otherwise nearly smooth; posterior carapacal margin with 14 setae, all stublike and very short; posterior transverse furrow fairly well marked; two pairs of eyes, the anterior eye of each side with well-developed convex lens, directed laterally and anteriorly; posterior eye of each side with more weakly developed lens, directed laterally and posteriorly; eyes nearly contiguous; length of carapace 1.27 mm ; width greatest posteriorly and equal to 1.25 mm ; width across carapace at a level between the eyes 0.7 mm . "Abdomen depressed, much broader behind than in front, broadest on 7 th segment, scutæ [sic!] short and quite broadly divided" (Banks, 1895); tergal scuta in part irregularly marked by scalelike sculpturing, anterior two tergites with fine granules on the anterior part of each, partly smooth, little sclerotic; all tergites except 1 and 11 divided; tergal halves with no more than 14 short and stubby setae. Sternites much like the tergites except the setae are a little less numerous and are longer and terminally acute; pleural membranes rugose; abdomen about 3.4 mm long, 2 mm wide in mounted lectotype.

Chelicera: Yellow in color; inner margin very much S-shaped, a marked concavity near the base of the fixed finger making the base appear distorted; surface of base smooth; setae acuminate; the three setae of the flagellum bladelike and with a few long and slender serrations placed unilaterally at and near the end of each; length of chelicera 0.37 mm , width of base 0.235 mm ; length of movable finger 0.32 mm . Fixed finger with outer margin distinctly convex; lamina exterior flatly convex in the central portion; tip of fixed finger very sclerotic, apical tooth with two conical denticles on the inner surface; inner margin of fixed finger with five or six retroconical teeth, the proximal one much reduced; serrula interior of 20 or more plates, the distal five or six modified. Movable finger a little curved; apical tooth very dark reddish brown and sclerotic; subapical lobe approximate to the apical tooth; a weak denticle may occur on the inner margin of the subapical lobe; galeal seta apparently not reaching the tip of the galea; both galeae terminally broken in lectotype; serrula exterior of between 25 and 30 plates,
probably about 27 (position of serrulae precludes accurate count).

Palpus: Moderately slender; surface apparently unsculptured except for granules on the maxilla and very weak granules on a part of the chelal hand and on the fingers, these last somewhat conspicuous; setae stubby, short, a little longer on the chelal fingers than elsewhere. Maxilla about 0.8 mm long, 0.4 mm wide. Trochanter with stout pedicle; flexor margin well rounded; length 0.63 mm , width 0.38 mm . Femur very slender; pedicle barely indicated; outer margin flatly convex except more convex in the distal one-third; inner margin weakly concave in the basal one-half, weakly convex beyond but with a weak concavity near the distal end; length 1.5 mm , width 0.34 mm . Tibia stouter than the femur; pedicle about as wide as long; inner margin weakly convex in the basal half but very weakly concave beyond; outer margin flatly convex (to almost a little concave) in the basal two-thirds, more convex beyond; length 1.31 mm , width 0.352 mm . Chela with the flexor margin evenly convex from the pedicle to the finger base; extensor margin very flatly convex; hand widest near the center; fingers very slender, gently curved; length of chela without pedicle 2.25 mm , width 0.6 mm ; length of hand without pedicle 1.08 mm , depth of hand 0.56 mm ; movable finger 1.26 mm long. From the side, ventral margin weakly but evenly convex; dorsal margin somewhat irregularly convex; hand deepest in the distal one-third and little narrowed at the base of the fingers; fingers little curved. Marginal teeth of chelal fingers small, conical, cusp-bearing, about 70 on the movable and about 80 on the fixed finger. Movable finger with four tactile setae: $t$ about one-sixth of the fingér length from the tip; st near the midpoint of the finger; $s b$ about one-fourth of the finger length from the base; $b$ midway between $s b$ and the finger base; nodus ramosus not observed. Fixed finger with et near tip of finger, it about one-sixth of finger length from tip; est almost one-third of finger length from tip; ist about one-third of finger length from base; $e b$ less than one-sixth of finger length from base, esb a little nearer $e b$ than ist; isb and $i b$ separated by about three areolar diameters and a little distal to the level of esb; nodus ramosus not determined because of granular nature and color of finger.

Legs: Slender; setae stubby, short, peglike except on the flexor margin of the tibia, metatarsus, and telotarsus where the setae are stout, relatively long, and acuminate; surface of legs not sculptured. First leg with pars basalis deepest at the very distal end, flexor margin nearly straight except at the proximal end, extensor margin conspicuously convex near the distal third, distal one-third of podomere swollen, length measured along the ex-
tensor margin 0.63 mm , depth 0.19 mm ; pars tibialis much shorter than the pars basalis, flexor margin convex, extensor margin little convex, length 0.4 mm , depth 0.185 mm ; tibia somewhat S-shaped, length 0.54 mm , greatest depth across the distal end 0.13 mm ; tarsal podomeres subcylindrical; metatarsus 0.38 mm long, 0.106 mm deep; telotarsus 0.325 mm long, 0.1 mm deep. Fourth leg with slender trochanter, flexor margin nearly straight, ex-


Figs. 1-3.-Garypus floridensis Banks, 1895, male lectotype: 1, Anterior portion of carapace to show the eyes; 2, dorsal view of palp, tactile setae of chelal fingers omitted; 3, lateral view of chela, marginal teeth not shown.

FIGS. 4, 5.-Pseudogarypus bicornis (Banks, 1895) Ellingsen, 1908: 4, Spines of first pedal coxae (A, entire coxae of male lectotype; B, portion of coxae of tritonymph cotype); 5 , dorsal view of palp; male lectotype, tactile setae of movable finger omitted.

Figs. 6-8.-Pseudozaona mirabilis (Banks, 1895), n. comb., male lectotype: 6, End of movable cheliceral finger; 7 , dorsal view of palp; 8 , lateral view of chela, teeth of chelal fingers omitted.
tensor margin markedly convex, length 0.61 mm , depth 0.26 mm ; pars basalis 0.38 mm long, 0.23 mm deep; pars tibialis with a straight flexor margin continuous with that of the pars basalis, extensor margin very weakly convex, length 0.96 mm , depth 0.27 mm ; entire femur 1.25 mm long; tibia slender, weakly S-shaped, length 1.01 mm , depth greatest at the distal end and equal to 0.15 mm ; tarsi subcylindrical; metatarsus 0.46 mm long, 0.13 mm deep; telotarsus 0.4 mm long, 0.11 mm deep; telotarsus with a stiff, weakly curved, and short pseudotactile seta placed 0.25 mm from the proximal margin of the podomere.

Genital complex: Posterior operculum with six to eight marginal setae and 12 to 14 setae in a compact double row on each lateral rim of the aperture; anterior operculum with nearly 35 setae, some scattered, but chiefly in a group just anterior to the aperture.

Female.-Examined only for details observable in the alcoholic specimen; apparently very similar to the male except that the palpal podomeres, especially the chela, are a little more slender. Body length about 4 mm . Palpal femur 1.5 mm long, 0.335 mm wide; tibia 1.33 mm long, 0.345 mm wide; chela without pedicle 2.25 mm long, 0.56 mm in width; chelal hand without pedicle about 1.08 mm long; movable finger at least 1.3 mm long.

Type locality.-Label accompanying collection reads: "under driftwood, ocean beach, nr . St. Lucie, Indian Riv., Fla., April 19, 1880. Coll. Hubbard. Type No. 4192 U.S.N.M."

Remarks.-This is the first detailed description of $G$. floridensis. Erroneously designated as this species, With (1907) described several individuals in a collection from Mustique Island. With's specimens are discussed under $G$. withi, new species, as given below.

## Garypus withi, new species

Garypus foridensis With (non Banks, 1895), 1906, Danske Vid. Selsk. Skrifter, 7. Række, naturvidensk. og mathem., 3: 41, fig. 9, pl. 2, figs. 4a-d; With, 1907, Journ. Linn. Soc. London, Zool., 30: 70-72, pl. 9, figs. 26-28; pro parte Beier, 1932, Das Tierreich 57: 220.
Under the name G. floridensis, With (1907) described in detail a pseudoscorpion species from Mustique Island, Windward Islands, West Indies. On comparing With's description with the lectotype of Banks's G. foridensis, it appears obvious that With did not have the

Florida species described by Banks. For this reason, the species described by With is here redesignated as $G$. withi, new species.

The chief differences between $G$. withi and G. floridensis are as follows: The eyes of each side in floridensis are approximate but they are well separated in withi (With, 1907, fig. 26); the pars basalis of the first leg of floridensis is distally much more widened and bulging than in withi (With, 1906, fig. 9); the serrations of the flagellar setae are much coarser and longer in floridensis than in withi (With, 1906, pl. 2, fig. 4b); and the length of the movable chelal finger is equal to the length of the femur in withi but appreciably shorter than the femur in floridensis.

Suborder Monosphyronida Chamberlin, 1929
Superfamily Feaelloidea Chamberlin, 1931
Family Pseudogarypidae Chamberlin, 1931
Pseudogarypus bicornis (Banks, 1895)
Ellingsen, 1908
Figs. 4, 5
Garypus bicornis Banks, 1895, Journ. New York Ent. Soc. 3: 8-9; non Pseudogarypus bicornis Ellingsen, 1908, Boll. Lab. Zool., Portici, 3: 218; pro parte Banks, 1911, Pomona Journ. Ent. 3: 637; non Chamberlin, 1923, Ent. News 34: $162-166$, pl. 5 , figs. 1-22; non Chamberlin, 1931, Stanford Univ. Publ., Biol. Sci., 7 (1); 231-232, figs. $6-\mathrm{E}, 9-\mathrm{L},-\mathrm{N}, 11-\mathrm{C}, 14-\mathrm{E}, 15-\mathrm{Q}$, $18-\mathrm{B}, 24-\mathrm{D}, 29-\mathrm{J}, 38-\mathrm{K}, 41-\mathrm{A},-\mathrm{B},-\mathrm{C},-\mathrm{D}, 42-\mathrm{K}$, -L, 51-A, -B; non Beier, 1932, Das Tierreich 57: 239-240; pro parte Roewer, 1937, in Bronn's Klass. und Ord. des Tierreichs 5 (div. 4, book 6): 271.

The type collection of this species consists of four individuals, of which one is a male lacking one of the palps. This specimen was mounted on a slide and is here designated as the lectotype. Of the other specimens, two are tritonymphs and one is an earlier nymph. One of the tritonymphs was mounted and is briefly described below. The earlier nymph is not in a condition suitable for study.

Male.-Description based on the lectotype. "Length, 2.5 mm . Brownish yellow, the cephalothorax and palpi darker than the other portions, a pale spot on the middle of the last two or three ventral segments. Cephalothorax narrow, somewhat triangular, much longer than broad, with a high elevated ridge each side, about parallel with the side margins, the
space between the ridges concave in anterior portion, convex behind; the anterior margin of the elevated portion is rounded; each lower anterolateral angle of the cephalothorax is prolonged into a conic tubercle, or horn, which is slightly longer than broad at base. There is a trace of the posterior suture, but the anterior one is very obscure; on each side there are two prominent eyes about their diameter apart, the posterior one on a tubercle and looking backward. The abdomen is broad and depressed, narrower at base than at posterior margin, broadest on the 6th segment, the segments plainly divided" (Banks, 1895). Carapace 0.7 mm long, 0.5 mm wide across the posterior margin; width of carapace at a level between the eyes 0.35 mm ; abdomen 1.85 mm long, about 1.5 mm wide. Carapace and tergites granular; intertergal spaces and pleural membranes marked by wavy striations, pleural membranes rugose.

Chelicera: Yellowish brown in color; base stout; outer and dorsal surfaces granular; setae including the flagellar ones so damaged that observations could not be made. Fixed finger short, terminally acute, lamina exterior vestigial; movable finger short, stout, little curved, apical tooth conical and short, galeae and galeal setae broken from both chelicerae, serrula exterior with probably about 17 plates (condition of specimen precludes an exact count); length of chelicera measured from base to tip of movable finger 0.29 mm , width of base 0.14 mm ; length of movable finger 0.105 mm .

Palpus:Slender;surface granular and marked by scalelike or netlike markings; setae evidently lost through long preservation in alcohol; orange or dark brownish yellow in color. Maxilla 0.49 mm long, 0.24 mm wide. Trochanter stout; pedicle very narrow; basal margin of trochanter beyond the pedicle nearly straight; flexor margin almost straight, extensor margin rounded; length of trochanter including pedicle 0.32 mm , width 0.22 mm . Femur subcylindrical; extensor margin flatly convex; flexor margin weakly concave in the basal portion, slightly convex near the distal fourth, weakly concave beyond; pedicle no longer than wide and fairly well set off from rest of podomere; length 1.09 mm , width 0.201 mm . Tibia pedicellate, gradually increasing in width toward the distal end; flexor margin basally concave, then a little convex, then
weakly concave or nearly straight beyond the midpoint; extensor margin flatly convex; length 0.53 mm , width 0.19 mm . Chela with both flexor and extensor margins of the hand flatly to weakly convex; pedicle displaced a little towards the outer side; fingers very slender, long, and straight; length of chela without pedicle 1.32 mm , width 0.275 mm ; chelal hand without pedicle 0.51 mm long; movable finger 0.8 mm long. Side view of chela not obtained. Teeth spaced, not contiguous; peglike, not conical; probably between 35 and 40 teeth on each chelal finger. Tactile seta of movable finger difficult to observe with certainty in present material; $t$ appears to be somewhat more than one-fifth of the finger length from the tip, st is less than one-half as far from $t$ as the latter is from the finger tip and much nearer to $t$ than to $s b$; $s b$ near the midpoint of the finger; $b$ about as far from $s b$ as $s t$ is from $t$. On fixed finger, $i t$ is about one-fifth of the finger length from the tip; et is twice as far from the finger tip as from the level of $i t$; ist near the midpoint of the finger, est very little distal to $i s t$; esb and eb about three areolar diameters apart and with $e b$ about one-fifth of the finger length from the base; isb very little distal to the level of esb and $i b$ very little distal to the level of $e b$.

Legs: Granular, surface marked by netlike lines; few remaining setae indicate that investing setae were short and acuminate, much longer on the flexor surface of the tarsi than elsewhere. First leg with each coxa displaying five to seven spines in the triangular posterior portion; coxa granular and marked as other podomeres of leg; trochanter with a narrow pedicle, rest of podomere globose, length 0.255 mm , depth 0.145 mm ; pars basalis pedicellate, flexor margin nearly straight, extensor margin weakly concave, length 0.4 mm , depth 0.11 mm ; pars tibialis with both margins weakly convex, length 0.34 mm , depth 0.114 mm ; tibia markedly bent near the proximal one-third, flexor margin convex and extensor margin concave beyond the proximal one-third, length 0.32 mm , depth 0.084 mm ; tarsus weakly curved, extensor margin a little convex, flexor margin a little concave, length 0.53 mm , depth 0.065 mm . Fourth leg with trochanter relatively slender, fusiform, length 0.37 mm , depth 0.14 mm ; pars basalis and pars tibialis with much the same shape as in the first leg; pars
basalis 0.31 mm long, 0.1 mm deep; pars tibialis 0.45 mm long, 0.12 mm deep; tibia very slender, suddenly bent near the base, S-shaped, length 0.57 mm , depth 0.08 mm ; tarsus markedly curved with the flexor margin evenly concave, length 0.72 mm , depth 0.065 mm .

Genital complex: A group of four setae on each lateral rim of the aperture; anterior operculum with 25 setae arranged in a compact group anterior to the aperture and, in addition, a few setae scattered on the surface; posterior operculum with nearly 25 setae in a compact group just posterior to the aperture, few other setae on the face of the operculum.

Female.-Not available for study.
Tritonymph.-Description based on one mounted tritonymph. As noted by Banks (1895) the general appearance of the tritonymph is not much different than that of the adult. Body length 2.3 mm ; carapace 0.57 mm long, 0.5 mm wide; ocular breadth 0.33 mm ; abdomen 1.75 mm long, 1.45 mm wide.

Chelicera: Much as in the adult; flagellum with two entire setae; plates of serrula exterior not determined; length of chelicera 0.27 mm , width of base 0.13 mm , length of movable finger 0.095 mm .

Palpus: General appearance, sculpturing, and chaetotaxy as in the male; podomeres a little stouter (except perhaps the chela) but of same general shape except that the outer margin of the tibia is a little concave near the center. Trochanter 0.28 mm long, 0.2 mm wide; femur 0.9 mm long, 0.185 mm wide; tibia 0.45 mm long; 0.175 mm wide, chela without pedicle 1.13 mm long, 0.24 mm wide; hand without pedicle 0.44 mm long, 0.225 mm deep; movable finger 0.7 mm long. In side view, both dorsal and ventral margins of the chelal hand are nearly straight to very weakly convex; fingers slender, the fixed nearly straight, the movable gently curved. Marginal teeth of chelal fingers peglike, not contiguous, much as in the male lectotype; fixed finger with 36 teeth, movable finger with 30 teeth. Movable finger with three tactile setae: $t$ between onethird and one-fourth of the finger length from the tip, st within the distal one-half of the finger and about two-thirds as far from $t$ as $t$ is from the finger tip; the third seta, probably $s b$, located about one-third of the finger length from the base; st appreciably closer to $t$ than to $s b$. Fixed finger with et about one-seventh of
the finger length from the tip; it one-half as far from et as the latter is from the finger tip; est just proximal to the midpoint of the finger, ist very little distal to est; esb about one-fourth of the finger length from the base, $e b$ about three areolar diameters basal to esb; isb a little basal to the level of $e s b, i b$ wanting; near the very tip of the fixed finger occur two setae, each a little less well developed than the regular tactile setae, these being suggestive of the pair of setae (designated usually as $x s$ ) found near the finger tip in certain groups of the Heterosphyronida.

Legs: Chaetotaxy and sculpturing as in the male; like the adult in general shape but a little smaller in size and many podomeres a little stouter. Coxa of each first leg with four spines like those in the lectotype; first leg with trochanter 0.21 mm long, 0.121 mm deep; pars basalis 0.32 mm long, 0.097 mm deep; pars tibialis 0.28 mm long, 0.095 mm deep; tibia 0.24 mm long, 0.075 mm deep; tarsus 0.43 mm long, 0.06 mm deep. Fourth leg with trochanter 0.34 mm long, 0.13 mm deep; pars basalis with extensor margin very weakly convex, length 0.24 mm , depth 0.099 mm ; pars tibialis 0.37 mm long, 0.117 mm deep; tibia 0.45 mm long, 0.076 mm deep; tarsus 0.59 mm long, 0.063 mm deep.

Type locality.-Label with collection reads: "Specimen Ridge, Yellowstone Nat. Pk. Aug. 12, 1891. (In their cells moulting.) H. G. Hubbard. Type No. [U.S.N.M.] 4191."

## Superfamily Cheliferoidea <br> Chamberlin, 1931

Family Chernetidae Menge, 1855
Subfamily Chernetinae Beier, 1932
Tribe Hesperochernetini Beier, 1932
Dinocheirus arizonensis (Banks, 1901) Beier, 1933
Chelanops arizonensis Banks, 1901, Proc. U. S. Nat. Mus. 23: 589, pl. 22, fig. 2; Chamberlin, 1923, Proc. California Acad. Sci. (ser. 4) 12: 379-380, pl. 3, figs. 8, 30.
Hesperochernes arizonensis Beier, 1930, Ann. Naturh. Mus. Wien 44: 213-214, fig. 9.
Epaphochernes arizonensis Beier, 1932, Das Tierreich 58: 173-174, figs. 181, 182; Beier, 1933, Zool. Jahr. (Syst.) 64: 537.
Dinocheirus arizonensis Beier, 1933, Zool. Anz. 104: 100; Chamberlin, 1934, Pan-Pacific Ent. 10: 128, figs. D, E, Q, T, U, Z; Roewer, 1937, in Bronn's Klass. und Ord. des Tierreichs 5 (div. 4, book 6): 302.

The U. S. National Museum cotype collection of this species contained three individuals. On examination, two of these were found to belong to "Chelifer" hubbardi Banks, 1901, a species that lives with $D$. arizonensis. The single individual of $D$. arizonensis, a female, has been indicated as the lectotype and is briefly described below.

Male.-Not in cotype collection; previously described by Chamberlin (1923b, 1934) and Beier (1930).
Female.-Since the female lectotype agrees well with the descriptions and figures given by Chamberlin (1923b, 1934) and Beier (1930), the present description is restricted chiefly to measurements. Body 4.2 mm long; carapace 1.2 mm long, nearly 1 mm wide across the posterior margin; eye spots very weak; 10 setae in an irregular row along the posterior carapacal margin; posterior transverse furrow a little closer to the posterior carapacal margin than to the median furrow. Abdomen with tergites except the eleventh divided; medial interscutal spaces wide and rugose; each first tergal half with seven setae, maximum number of setae on any half-tergite is nine; setae stout, terminally denticulate, not clavate; tergal scuta weakly granular. Sternites except the eleventh divided; very weakly sculptured; setae acuminate, long; each fourth sternal half with five or six setae; maximum number of setae on any one sternal half is 12 ; each anterior stigmatic plate with three setae, each posterior plate with two; pleural membranes marked by wavy, rugose striations.

Chelicera: Brown in color; fixed finger with five retroconical denticles on the inner margin; galea stout, probably six terminal and subterminal simple rami in the distal two-thirds of the galea; serrula exterior of 20 or 21 ligulate plates; length of chelicera measured from the tip of the fixed finger to the basal margin 0.31 mm , width of base 0.2 mm ; movable finger nearly 0.25 mm long.

Palpus: Setae paucidenticulate to subacuminate except acuminate on fingers and maxilla; most setae relatively long. Trochanter 0.61 mm long, 0.37 mm wide; femur 0.96 mm long, 0.38 mm wide; tibia 0.96 mm long, 0.41 mm wide; chela without pedicle 1.61 mm long, 0.65 mm wide; chelal hand without pedicle 0.85 mm long, 0.65 mm deep; movable finger 0.9 mm in length. Marginal teeth of chelal
fingers small, conical, cuspid; more than 50 marginal teeth on each finger, extending almost the entire length of the finger; movable finger with nine external and six internal accessory teeth; fixed finger with seven external and eight internal accessory teeth; accessory teeth confined in general to the distal one-half of each finger. Tactile setae of fingers as shown by Chamberlin (1934, fig. Q), except $t$ and st of the movable finger are removed a little farther from the finger tip and on the fixed finger, ist is considerably distal to est.
Legs: First leg with trochanter 0.25 mm long, 0.2 mm deep; pars basalis 0.22 mm deep; pars tibialis 0.182 mm deep; entire femur 0.72 mm long; tibia 0.56 mm long, 0.13 mm deep; tarsus 0.51 mm long, 0.085 mm deep. Fourth leg with trochanter 0.45 mm long, 0.228 mm deep; pars basalis 0.37 mm long, 0.225 mm deep; pars tibialis 0.69 mm long, 0.24 mm deep; entire femur 0.96 mm long; tibia 0.81 mm long, 0.152 mm deep; tarsus 0.58 mm long, 0.105 mm deep, tactile seta 0.35 mm from the proximal margin of the tarsus.

Genital complex: Essentially as pictured by Chamberlin (1923b, pl. 3, fig. 30).

Type locality.-"Oracle, Ariz.; July, 1898; E. A.Schwarz;in Dasylirion wheeleri, U.S.N.M. 5431."

## Pseudozaona mirabilis (Banks, 1895), n. comb. <br> Figs. 6-8

Chelifer mirabilis Banks, 1895, Journ. New York Ent. Soc. 3: 4.
Chelodamus mirabilis R. V. Chamberlin, 1925, Bull. Mus. Comp. Zool. 57: 237.
Parachelifer (?) mirabilis Beier, 1932, Das Tierreich 58: 241; Roewer, 1937, in Bronn's Klass. und Ord. des Tierreichs 5 (div. 4, book 6): 313.

The U. S. National Museum collection consists of two cotypes, one male and one female. Both of these have been mounted on slides; the male is designated as the lectotype.

Male.-Description based on the lectotype. Body and carapace fairly stout; palps and legs very slender; body, carapace, and legs light yellowish brown, palps deep reddish brown; length of body 2.8 mm . Carapace moderately granular; anterior margin well rounded, other margins weakly convex; setae fairly numerous, multidenticulate, subclavate to virtually clavate; posterior margin with a row of 13 setae; transverse furrows well marked, the posterior
one much closer to the posterior carapacal margin than to the median furrow; eye spots not distinguished; length of carapace 0.96 mm , width greatest across the posterior margin and equal to 0.86 mm . Tergites of abdomen divided except the eleventh; not very sclerotic; weakly sculptured, the interscutal areas much more granular than the scuta themselves; setae subclavate to clavate, each fourth tergal half with six or seven setae, maximum number on any tergal half is seven. Sternites little sclerotic, very weakly sculptured; sternites 4 through 10 divided; setae acuminate; each fourth halfsternite with three or four setae; some central sternal halves with as many as 10 setae; each anterior stigmatic plate with three setae, each posterior plate with one; pleural membranes striated, very rugose; abdomen oval in shape, 1.85 mm long, 1.35 mm wide.

Chelicera: Dark yellow in color; moderately stout; subbasal seta very weakly denticulate, basal seta entire; flagellum of four setae, of which two are long, two are relatively short; on one chelicera, one of the short setae is broken while on the other chelicera, one of the long setae is missing; length of chelicera about 0.31 mm , width of base 0.17 mm ; length of movable finger 0.255 mm . Fixed finger little curved, in poor condition for study; apparently five retroconical teeth on the inner margin of the finger. Movable finger somewhat straight; apical tooth unequally bicuspid; subapical lobe conical and located at very base of apical tooth; inner finger margin with one or two weak denticles at the level of the insertion of the galeal seta; serrula exterior apparently consisting of about 19 plates; galeal seta extending little beyond the tip of the galea; galea with six simple rami arranged along most of the length of the galea.

Palpus: Surface of maxilla and trochanter and the flexor surface of the femur and tibia finely granular, granules on the extensor surface of the femur hardly discernable, extensor surface of the tibia and the entire chelal hand and fingers virtually smooth; setae of maxilla acuminate; setae otherwise subclavate to clavate becoming paucidenticulate on the extensor side of the tibia and the chelal hand; setae of chelal fingers acuminate. "Palpi slender; trochanter pedicellate, tubercled above near tip; femur slightly longer than cephalothorax, gradually enlarged from base to near
tip, inner margin straight, outer slightly convex; tibia three-fourths [sic!] as long, and slightly broader than femur, quite long pedicellate, outer margin slightly and evenly convex; inner margin convex at base, then nearly straight; hand about as long as tibia, slightly convex on outer margin, quite strongly and evenly on the inner margin, tapering to the fingers, which are about as long as the hand and quite strongly curved" (Banks, 1895). Measurements of palpal podomeres when seen from the dorsad as follows: trochanter 0.56 mm long, about 0.27 mm wide; femur 1.03 mm long, 0.26 mm wide; tibia 0.93 mm long, 0.28 mm wide; chela without pedicle 1.58 mm long, 0.39 mm wide; chelal hand without pedicle 0.82 mm long, 0.37 mm deep; movable finger of chela 0.86 mm long. From the side, chela is slender; pedicle displaced far towards the ventral margin of the hand; ventral margin of hand evenly and weakly convex, dorsal margin much more convex; fingers slender, the fixed one nearly straight, movable finger a little curved. Marginal teeth of chelal fingers small, conical, contiguous, cusp-bearing; many marginal teeth so worn or broken that an accurate count is difficult; probably 60 or more marginal teeth on each finger; apparently 10 external and two internal accessory teeth (some may be broken) on the fixed finger; accessory teeth of movable finger not accurately determined; all accessory teeth relatively weak. Movable finger with tactile seta $t$ within the distal one-third of the finger; sb about onefifth or a little less of the finger length from the base; $b$ midway between $s b$ and the proximal finger margin; st slightly proximal to the midpoint of the finger and a little nearer $t$ than $s b$, nodus ramosus at a point midway between $t$ and st. Fixed finger with et almost one-sixth of the finger length from the tip; $i t$ a little closer to et than the latter is to the finger tip; est located a little proximal to the midpoint of the finger, ist a little distal to the midpoint, est and ist separated by a distance less than the width of the finger at the level of $i s t ; i b$ and $i s b$ about as far from the finger base as $i t$ is from the finger tip; esb a little proximal to the level of $i b$, about one-fourth of the finger length from the proximal finger margin; $e b$ about four areolar diameters basal to esb.

Legs: Very slender; not noticeably sculptured; setae chiefly multidenticulate to sub-
clavate except acuminate on the flexor surface of the tarsi; tarsal claws simple. First leg with trochanter 0.23 mm long, 0.153 mm deep; pars basalis 0.17 mm deep; pars tibialis with flexor margin nearly straight, extensor margin a little convex, depth 0.133 mm ; entire femur 0.67 mm long; tibia S-shaped, length 0.51 mm , depth, 0.098 mm ; tarsus deepest near the center, extensor margin a little concave, flexor margin a little convex, length 0.51 mm , depth 0.076 mm . Fourth leg with pars basalis 0.3 mm long, 0.17 mm deep; pars tibialis with the two margins almost parallel, slightly curved throughout its length, 0.67 mm long, 0.17 mm deep; entire femur almost 0.9 mm long; tibia weakly S-shaped, very slender, 0.8 mm long, 0.11 mm deep; tarsus subcylindrical, a little narrowed distally, length 0.57 mm , depth 0.084 mm .

Genital complex: About 15 setae on the surface of the posterior operculum and four very small setae on the posterior rim of the aperture; anterior operculum with about 20 setae, an accurate count impossible in lectotype.
Female.-Description based on a single cotype. Essentially like the male; body length 3.6 mm . Carapace with 12 setae along the posterior margin; length of carapace 0.96 mm , greatest width across the posterior margin and equal to 0.97 mm . Tergites like those of the male; maximum number of setae on any tergal half is eight; sternites and stigmatic plates as in the opposite sex; length of abdomen about 2.65 mm , width 1.9 mm .

Chelicera: Essentially like that of the male; six well-developed but simple rami arranged more or less unilaterally along the entire length of the galea, the basal rami much longer than the more distal ones; length of chelicera about 0.32 mm , width of base 0.175 mm , movable finger about 0.26 mm long.

Palpus: Chaetotaxy, sculpturing, and shape of podomeres as in the lectotype. Measurements of palpal podomeres as follows: maxilla 0.56 mm long, 0.37 mm wide; trochanter 0.59 mm in length, 0.3 mm in width; femur 1.11 mm long, 0.28 mm wide; tibia 1 mm long, 0.31 mm wide; chela without pedicle 1.65 mm in length, width 0.425 mm ; chelal hand without pedicle 0.85 mm long, 0.415 mm deep; movable finger at least 0.85 mm in length. Chelal fingers with marginal teeth much as in the lectotype; accessory teeth somewhat more numerous than
in the male, about 12 external and eight to 10 internal accessory teeth on each finger; all teeth small, sometimes broken, and difficult to count accurately. Movable finger with $t$ in the distal one-third of the finger, st near the finger midpoint; $s b$ about one-fourth of the finger length from the base; $b$ midway between $s b$ and the proximal finger margin. Fixed finger with est and ist very near the midpoint of the finger, the former slightly proximal to the latter; isb and $i b$ on about the same level; other tactile setae as in the male.

Legs: Shape of podomeres, chaetotaxy, and sculpturing much as in the male. First leg with trochanter 0.255 mm long, 0.17 mm deep; pars basalis 0.187 mm deep; pars tibialis 0.145 mm deep; entire femur 0.725 mm long; tibia 0.55 mm long, 0.11 mm deep; tarsus 0.51 mm in length, about 0.08 mm in depth; tarsus with both margins very weakly convex. Fourth leg with trochanter 0.41 mm long, 0.2 mm deep; pars basalis 0.342 mm in length, 0.175 mm in depth; pars tibialis 0.72 mm long, 0.182 mm deep; entire femur 0.98 mm long; tibia 0.85 mm in length, 0.125 mm in depth; tarsus 0.61 mm long, 0.091 mm deep.

Genital complex: Posterior operculum with 12 setae arranged in a marginal row; anterior operculum with a single row of 11 setae anterior to a group of 15 setae scattered on the face of the operculum.

Type locality.-The label accompanying the cotypes reads: "Indian Cave, Barren Co., Ky. July 24, 1881. H. G. Hubbard. U.S.N.M. 4195." Banks (1895) also reports the species from a cave at Pennington Gap, Va., but the specimens from this locality were not seen by the present writer.

Remarks.-The present species shows close relationship with the two other species of Pseudozaona: P. communis Beier, 1932, the genotype from Mexico, and $P$. uniformis (Banks, 1914) Hoff, in press, from Costa Rica. From P. communis, P. mirabilis differs by having a much smaller body; the palpal femur, tibia, and movable chelal finger measure about two-thirds of the length of the same structures in P. communis, and the palpal femur and tibia as well as the podomeres of the fourth leg are more slender in P. mirabilis. Pseudozaona mirabilis is little smaller than $P$. uniformis but the palpal femur and tibia, as well as the fourth leg, are much more slender.

Family Chellferidae Hagen, 1878
Subfamily Cheliferinae Simon, 1879
Tribe Cheliferini Chamberlin, 1932
Parachelifer hubbardi (Banks, 1901) Chamberlin, 1932
Chelifer hubbardi Banks, 1901, Proc. U. S. Nat. Mus. 23: 588-589, pl. 22, fig. 9; Chamberlin, 1923, Proc. California Acad. Sci. (ser. 4) 12: $374-375$, pl. 2, fig. 10, pl. 3, fig. 33.
Parachelifer hubbardi Chamberlin, 1932, Can. Ent. 64: 19; Beier, 1932, Das Tierreich 58: 240; Roewer, 1937, in Bronn's Klass. und Ord. des Tierreichs 5 (div. 4, book 6): 313.

Two specimens, one male and one female, of Parachelifer hubbardi were found in the type collection of Dinocheirus arizonensis, these two species having, according to Banks (1901), the same type locality and occurring in the same collection. While the present individuals may be from the original type collection, they are not labeled as types and therefore cannot be considered as such. The male has been mounted on a slide; the female was studied as an alcoholic. While these individuals are available, it seems advisable to give the following measurements and observations to supplement meager descriptions already existing in the literature.

Male.-Body 3.1 mm long; carapace 1.05 mm long, ocular breadth 0.51 mm ; each seta of the carapace inserted on the side of a conspicuous tubercle, 18 of these tubercles between the posterior transverse furrow and the posterior carapacal margin and, in addition, there is present a keel-like structure resembling somewhat the lateral keels of the tergites and located at each posterolateral corner of the carapace; each of these structures bears two setae. All tergites except the last two with well-developed keels; tergites 1 through 4 not divided; 14 to 16 clavate setae on the central tergal halves; sternites 5 through 11 divided; posterior stigmatic plate with one seta, anterior stigmatic plate asetaceous; pleural membranes weakly and irregularly striate.

Chelicera: Fairly stout, dorsum of hand with netlike markings; basal seta with a few terminal and subterminal denticulations, subbasal seta with only one or two subterminal denticulations; longest flagellar seta with a few serrations along one edge; length of chelicera nearly 0.28 mm , width of base 0.16 mm , movable finger 0.19 mm long. Fixed finger with
three strongly developed retroconical denticles near the distal end of the inner margin. Movable finger with moderately well-developed subapical lobe; serrula exterior of 18 or 19 ligulate plates; galea with four simple rami confined to the terminal one-half; galeal seta extending a little distance beyond the tip of the galea.

Palpus: Proximal podomeres moderately granular, chelal hand finely granular, chelal fingers almost smooth; setae short and multidenticulate to paucidenticulate, except acuminate on the chelal fingers; some setae on the basal half of the femur inserted on tubercles raised slightly above the general surface of the podomere. Shape of palpal podomeres much as shown by Chamberlin (1923b, pl. 2, fig. 10) for a female paratype at the Museum of Comparative Zoology. Palp of present specimen with measurements as follows: trochanter 0.57 mm long, 0.29 mm wide; femur 1.33 mm long, 0.235 mm wide; tibia 1.21 mm long, 0.263 mm wide; chela without pedicle 1.74 mm long, 0.45 mm wide; chelal hand without pedicle 0.89 mm long, 0.4 mm deep; movable finger 0.91 mm long. Tactile setae of movable finger with st a little proximal to the midpoint of the finger and a very little closer to $t$ than to $s b$; $s b$ just within the basal one-fourth of the finger, $b$ mid way between $s b$ and the proximal finger margin; nodus ramosus about two areolar diameters proximal to tactile seta $t$. Fixed finger with est just proximal to the level of ist and both est and ist a little proximal to the midpoint of the finger; it midway between ist and the finger tip; et on a level midway between it and the finger tip; other setae near the base of the finger; nodus ramosus about midway between the levels of tactile setae it and ist.

Legs: Granular, becoming somewhat scalelike in sculpturing on the tibia and the tarsus of each leg; setae paucidenticulate becoming acuminate on the flexor surface of the tarsus of each leg; extensor surface of the pars tibialis and trochanter of each leg with some setae inserted individually on tubercles, more conspicuous on the pars tibialis of the fourth leg than elsewhere. First leg with measurements as follows: depth of pars basalis 0.21 mm ; depth of pars tibialis 0.163 mm ; entire femur 0.79 mm long; tibia 0.625 mm long, 0.135 mm deep; tarsus 0.545 mm long, 0.115 mm deep, the depth greatest across the distal end and
measured only to the base of the tarsal spine, not including the spine. Fourth leg with pars basalis 0.32 mm long, 0.2 mm deep; pars tibialis 0.93 mm long, 0.304 mm deep; entire femur 1.1 mm long; tibia 0.92 mm long, 0.152 mm deep; tarsus 0.69 mm long, 0.11 mm deep.

Genital complex: Posterior operculum with numerous (probably about 40) very fine setae well scattered on the face of the operculum and 10 setae on the very posterior rim of the genital aperture; anterior operculum very setaceous, bristly in general appearance.

Female.-In general like the male. Body 2.7 mm long; carapace 1.04 mm long, 1.12 mm wide across the posterior margin; diameter just behind the eyes 0.55 mm . Carapace tubercular much as in the male; tergites without keels; all tergites divided; about as many tergal setae as in the male. As near as can be determined from specimen in alcohol, the chelicera including the galea resembles closely that of the male. Palps shaped as in the male and like the one figured by Chamberlin (1923b, pl. 2, fig. 10); palpal podomeres slightly more slender than in the male; trochanter 0.6 mm long, 0.31 mm wide; femur 1.52 mm long, 0.25 mm wide; tibia 1.36 mm long, 0.285 mm wide; chela without pedicle 1.88 mm long, 0.435 mm wide; hand without pedicle 1.02 mm long; length of movable chelal finger 0.975 mm . Legs much as in the male; measurements not secured. Genital complex very simple.

Locality.-Oracle, Ariz., July 1898, in Dasylirion wheeleri.

Remarks.-A study of the present individuals of $P$. hubbardi indicates the advisability of calling attention to three particulars which perhaps should be deleted from the revised diagnosis of the genus Parachelifer as given by Beier (1932). At least one of our specimens disagrees with Beier's generic diagnosis as follows:

The first four abdominal tergites are not always divided, this being contrary to Beier's statement "Tergite geteilt"; the tactile seta ist of the fixed chelal finger may be distal to est and not as Beier states: "Tasthaar ist etwas proximal von est gelegen"; and the setae of the palps are at the most subclavate and not as Beier indicates: "Borsten des Korpers und der Palpen kurz, gekeult."

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